**Lesson 6** Complex Shapes in p5.js

**How can we use p5 documentation to learn new shape functions?**

| **Overview** | |
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| In this lesson, students will use fill, stroke, and shape functions to finish drawing their robots. They will also practice using the p5 documentation to discover how to add new shapes to their robot sketches. Lastly, students will be introduced mouseX and mouseY to help them position these new shapes. | |
| **Lesson Objectives** | |
| Students will be able to   * Use built-in variables mouseX and mouseY to draw new shapes * Consult the p5 reference for documentation * Use p5 syntax to draw triangles, quadrilaterals, and other complex shapes | |
| **Suggested Duration** | |
| One period (45 minutes) | |
| **Blueprint Foundations Student Outcomes (**https://blueprint.cs4all.nyc/outcomes/) | |
| Abstraction  Analyze | **Give examples** of specific patterns in something I can see, do or touch. |
| Abstraction  Prototype | **Describe** different things I tried in order to achieve a goal. |
| Algorithms  Analyze | **Describe how** instructions can have different outputs depending on inputs. |
| Programming  Communicate | **Discuss** what can and cannot be done with a specific set of commands. |
| **Vocabulary** | |
| * Vertex: A point where lines meet; the corner of a geometrical shape. | |
| **Planning Notes** | |
| * Students should refer to their robot drawing worksheets that they used in Lesson 4. Print out [extra copies](https://drive.google.com/file/d/1fpkP_ULAhbsTFQAOq5CDDDtwx6f_wZR7/view?usp=sharing) for students who need a new worksheet. | |
| **Resources** | |
| * N/A | |
| **Assessments** | |
| * Circulate during **Independent Practice**. Check that students are able to:   + Navigate the p5.js reference page to find specific information   + Interpret the documentation to draw new shapes * Assess the student activity. Check that students are able to:   + Iterate and make improvements on an earlier project | |

| **Do Now:** |
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| * Share [this sketch](https://editor.p5js.org/mparker/sketches/gcSuYfoCs) with your students and have them answer this prompt:   + Move your mouse around the canvas and try to figure out what information is stored inside the mouseX and mouseY variables. |
| **Discussion:** |
| mouseX and mouseY:   * Tell students that today they will work with two more built-in variables: mouseX and mouseY. * Open up the sketch from the Do Now:     Slowly move your mouse around the canvas. Explain that mouseX and mouseY automatically store the current x position and y position of the mouse. Ask students how they can use this information to help them draw shapes in p5. |
| **Teacher Demo: Drawing a Triangle** |
| * Your students should already know to check the [p5 reference page](https://p5js.org/reference/) to remember how to use familiar functions, but today they will be using the p5 documentation to look up **new** information. * In this demo, you will model looking up the information to draw a new shape: a triangle. Open up the reference page and tell students that you’ll start by clicking on the category labeled “Shape”. This will jump further down the page, where “triangle()” is listed under 2D shapes.      * Note the syntax of the triangle function, and copy this line of code: triangle(x1, y1, x2, y2, x3, y3). * Return to the sketch from the Do Now, and paste in the code you just copied. Try running the code and ask students why no triangle appears. *Answer: This shows the parameters of a triangle, but we need to use real numbers (arguments) for the computer to know which x and y locations to use.* * Turn the copied code into a comment as a reminder of the syntax. Now use the mouse to determine which three points you’ll use to make the shape. Lastly, draw a triangle to the canvas. * Independent Practice:   + As students can see from the reference page, there are a limited number of shape functions. For example, there is no such thing as a diamond() or trapezoid() function. However, students can make diamonds and trapezoids using the quad() function.   + Using the same process you modeled by drawing a triangle, instruct students to look up how to draw a quadrilateral using the quad() function.   + Students should duplicate the sketch from the Do Now and rename it according to class convention, for example, “U1L6 quad() function”     - Note: Encourage struggling students to ask a neighbor to help them work through the documentation.   + Extension: Early finishers should experiment with the beginShape() and endShape() functions to recreate the following sketch:     [Solution](https://editor.p5js.org/mparker/sketches/QEsmbWeFj) for reference |
| **Student Activity: Iterating on the Robot** |
| * Have students duplicate their robot sketch, and change the name to something like Robot Drawing V2. * Instruct students to copy and paste text(mouseX + ", " + mouseY, 20, 20) into their new robot sketches. * Students should attempt to add new features to their robots using at least one new p5 function (e.g., line(), triangle(), quad(), or beginShape() ) |
| **Wrap Up** |
| * **[Design Journal]** Answer the following:   + What was easy about making new shapes?   + What was challenging?   + If you had more time, what would you add to your robot sketch? |
| **Extensions** |
| N/A |